increased frequency selectivity. These digital down converters will be subject to the same overload interference as the analog units.

The Commission also errs in the logic that it assumes that all MDS/ITFS operators will be changing out block downconverters in the next few years. **Many operations will continue to be analog operations and will have no need to change any equipment**. Included in these systems which have no plans to transition to digital operation are many ITFS operators which are not associated with wireless cable operators. In fact, the WCAI is not aware of any ITFS operators who are not associated with wireless cable operators who will be employing digital technology in the near future. Also, many operators have been installing digital ready block downconverters for the past few years and will not need to make any changes to their installed base of block downconverters.

BLANKETING INTERFERENCE TO MDS/ITFS

As noted in an Ex Parte letter filed with the Commission by BellSouth on January 30, 1997, WCS operations can cause the initial stage of an MDS/ITFS block downconverter to overload. This power overloading of the block downconverter will cause the resulting television picture to be unviewable due to multiple intermodulation products in the picture. This type of interference is similar in nature to the blanketing interference as defined on Section 22.353 of the Commission's Rules.

In specific, due to the nature of the MDS and ITFS which encompass frequencies from 2.15 GHZ to 2.69 GHz, the receiving devices, antennas and block downconverters, must be broadband in nature. As such, the frequency selectivity must be somewhat limited. It was generally agreed within the subcommittee, which included three of the major manufacturers of block downconverters, that the signal power level at which overload of the block downconverter occurs, the 1 dB compression point of the input stage, is -6 dBm.

To determine the power present at the input stage of the block downconverter from any source, the following formulae are employed.

Power at input stage (P_{is}) = [transmit EIRP] - [Path Loss(P_l)] + [Gain of receive antenna(G_{rx})]

where $P_l = 36.8 + 20\log(D) + 20\log(F)$

D = Path Length in miles
F = Transmission frequency in MHZ.

For the analysis of possible overload by WCS, it was assumed that the WCS transmit site was at a point in the MDS/ITFS system where the MDS/ITFS operator would be employing a 24 dBi receive antenna to receive an acceptable MDS/ITFS signal. As it is reasonable to assume a broad distribution of WCS transmit sites, it was assumed that the MDS/ITFS receive site was within 300 FT of the WCS transmit site.

To determine the WCS EIRP above which block downconverter overload will occur, the following formulae where employed.

$$P_{is}max = -6\ dBm = EIRPmax - P_l + G_{rx}$$

$$EIRPmax = -6 + [36.8 + 20log(300/5280) + 20log(2305)] - 24$$

$$EIRPmax = 49\ dBm = 82\ W$$

Therefore, any WCS transmitter with an EIRP of greater than 82 W will cause the MDS/ITFS block downconverters to overload. In addition, good engineering practice requires that the input power be limited to 6 dB to 10 dB below the overload point. As such, **the WCS EIRP should be limited to no more than 20 W to allow continued operation of the MDS/ITFS systems**.

Clearly, given the reasonable assumption that WCS transmit sites will be distributed throughout the market, if the power of WCS is not limited, the very existence of MDS/ITFS systems is threatened.

PRESENT OPERATION OF BLOCK DOWNCONVERTERS

As a matter of clarity, it should be noted that the present installed base of block downconverters have been designed for and do not experience interference from the previous licensees and uses of the reallocated WCS spectrum. In paragraph 157 of the Order, the Commission states that MDS/ITFS "... downconverters receive all signals throughout the entire 2.1-2.7 GHz band..." In a very broad sense, this statement is correct, at least with respect to those bolck downconverters which are designed to operate in both the 2.1 GHZ and 2.5 Ghz bands. However, it can lead the reader to believe that the block downconverters, and specifically dual band block downconverters, have no filtering in the frequency band 2.162-2.5 GHz to lessen the interference potential of signals at these frequencies not employed by MDS/ITFS operators. That is not correct. Filtering does exist and filters the unwanted signals from present operations in that band.

The block downconverters were designed in a cost effective manner to allow the MDS/ITFS operator to provide competition in the Multichannel Video Market and the units have performed that function well for years. **It is only the change in the type of service and associated Rules for WCS that has participated the interference**.

GENERATION OF THIRD ORDER INTERMODULATION PRODUCTS

As demonstrated in the attached transmit site intermodulation studies, the potential exists for the generation of third order intermodulation products at a collocated PCS and WCS transmit site which will fall into the MDS/ITFS bands. In addition, these products can cause in-band interference to the GPS frequency band. If the power of the WCS transmissions are not limited, the probability of generation of these in-band interference products increases dramatically.

INTERFERENCE TO THE ISM BAND

It also came to the attention of the subcommittee that various unlicensed operations in the 2.4 GHZ band exist and would most probably experience blanketing interference as well. Most of these units operate at a very low power level and, as such, will be overwhelmed by the WCS unlimited power. Information concerning several of these products is attached for reference.

CONCLUSION

As demonstrated above, the Rules adopted in the Order pose a serious threat of interference to the present MDS/ITFS operations. In addition, without power limitations being adopted for the WCS, no equipment can be designed or promulgated to mitigate this interference. As such, **the Commission must reconsider its recent actions and provide reasonable and necessary protection to the MDS/ITFS industry.**

The subcommittee members are as follows:

Operators

Mr. Kelly Balius - Wireless One
Mr. James Gracie - CAI Wireless
Mr. Al Kuolas - Pacific Telesis
Mr. Michael Denny - PCTV
Mr. Brian Scott - ATI
Mr. Bob Saunders - BellSouth

Manufacturers

Mr. Robert Hannah - California Amplifier
Mr. John Wachsman - Pacific Monolithics
Mr. Dale Hemmie - Conifer

Respectfully submitted,

T. Lauriston Hardin, P.E.
Chairman, Engineering Committee
Wireless Cable Association International
March 3, 1997

LETTER FROM PACIFIC MONOLITHICS

Solutions For Wireless Communications

March 1, 1997

Mr. Lauriston Hardin
President
Hardin and Associates
1300 Diamond Springs Rd.
Suite 600
Virginia Beach, Virginia 23455

via facsimile (757) 464-2148

Dear Mr. Hardin :

This letter outlines Pacific Monolithics' concern of potential interference of the new Wireless Communication Services at 2305-2320 MHz and 2345-2360 MHz with existing and future MMDS receive installations. The recent WCS Report and Order FCC 97-50 did not protect the existing 1,000,000 educational and commercial installations. Additionally, the virtually unlimited EIRP for WCS makes it impossible to embark on an improved downconverter design. The design complexity (and unit cost) of any downconverter rises geometrically as an in-close out-of-band interfer EIRP increases. In other words, if the EIRP of WCS is unlimited then the design complexity (and unit cost) is also unlimited.

The "overlay" of an essentially adjacent frequency WCS cellular architecture and traditional MMDS broadcast technology requires more (not less) rules governing interference protection. The relative strength of the signals impinging on an MMDS downconverter is based on the relative powers and distances to the MMDS and WCS sites. MMDS being broadcast and WCS being cellular ensures that MMDS will "lose" dramatically on the distance portion of the equation. As it stands now, WCS can always "win" on the relative power portion of the equation.

The comment in section 157 Decision, " ... have vastly improved frequency selectivity and would not receive WCS signals.", greatly distorts reality. Frequency selectivity will never stop a downconverter from receiving WCS signals. It will only reduce the amount of unwanted WCS signal. The design challenge for manufacturers would be to provide sufficient frequency selectivity such that the unwanted WCS signal are sufficiently diminished for proper MMDS operation. However, the required frequency selectivity can not be defined because the WCS power is virtually undefined. If the WCS power is defined, it should be noted that the amount of selectivity is limited. The WCS band is close to the MMDS band and falls between MMDS and MDS frequency and therefore limits the amount of selectivity that is economically feasible.

The following sentence in section 157, "Also, the digital downconverters to which the MDS/ITFS industry is expected to convert over the next several years are expected to be better designed and not subject to overloading from WCS signals.", is also misleading. The term "digital downconverter" essentially means that the local oscillator in the downconverter has improved phase noise performance. This improvement has NO impact to the sensitivity to overload conditions. If the assumption is that digital processing technology will provide a higher degree of immunity to WCS, then it is clear the FCC has not considered all the markets that are analog today and will remain analog into the forseeable future. This includes virtually all the distance learning operations outside the major markets. Additionally, "not subject to overloading from WCS signals.", can have no basis of fact unless the WCS EIRP has some reasonably defined limit.

It is important to note Pacific Monolithics' position on the following comment including in section 157.

" Thus, to the extent that we may in the future, based on actual WCS operations, find it necessary to adopt an interference rule for WCS, we would protect only those MDS/ITFS downconverters installed within a year from the adoption date of this Report and Order. After that time, we would expect that only more spectrally efficient downconverters would be installed by MDS/ITFS licensees."

The undefined nature of WCS power level makes it is impossible to calculate the magnitude of selectivity required. Therefore, PM can not embark on a design effort to develop a "more spectrally efficient downconverter" that will ensure successful operation. As stated section 157, "without a clear sense of what particular WCS licensees will provide, and how soon they will be operational, the interference impact of WCS operations on MDS and ITFS is unclear.", no one can define the interference impact. Therefore, there is no way for a manufacturer to develop product to work in an undefined environment. It is only reasonable to "start the clock" after the environment is defined. The FCC has allowed the environment to only be defined once the actual WCS services and architectures are determined. Even then there are really no interference protections due to the language of the FCC regulations. For instance, PM might be able to develop a downconverter to ensure operation within the initial roll-out concepts of a WCS service. Some time later a WCS licensee could greatly increase power and do so with no consideration for the MMDS operator.

All of the uncertainty is removed if the FCC would simply define the maximum allowed EIRP for WCS. I personally do not know of any other frequency band that does not have a EIRP specification. In hopes of defining the EIRP, I provided Mr. Robert Saunders of Bell South an analysis of the maximum WCS power an existing ITFS/MDS downconverter could tolerate. I have included it for completeness.

If you have any questions or need additional information please call me at (408) 745-2810 or fax me at (408) 734-2656.

Sincerely,
Pacific Monolithics, Inc.

John M. Wachsman
Vice President, Marketing

WCS overload analysis

Assumptions :

Input 1 dB compression point of MMDS receiver input stage = - 6 dBm
Gain of MMDS receive site antenna (Gant) = 24 dBi
Distance from WCS transmitter = 100 yds

What is the maximum EIRP of the WCS transmitter without compressing this installation ?

EIRP - path loss + Gant $\leq$ - 6 dBm

EIRPmax = - 6 + (20 log (100/1760) + 20 log (2305) +36.8) - 24

= - 6 + (-24.91 +67.25 +36.8) -24

= 49 dBm

= 80 W

WCS EIRP levels of greater than 80 W will begin to compress the input amplifier stage. Since video is an amplitude modulated signal it is important to remain in the linear range of the receiver. Good engineering practice requires the input power to be 6 to 10 dB below the compression region. This would limit the WCS EIRP to 8 to 20 W.

LETTER FROM CALIFORNIA AMPLIFIER

California Amplifier

February 28th, 1997

Mr. Lauriston Hardin
Hardin and Associates, Inc
1300 Diamond Springs Road, Suite 600
Virginia Beach, VA 23455

Dear Lauriston,

Further to our telephone conversation regarding the Commission's WCS Report and Order, I am writing to you to express our concerns over the WCS Report and Order.

California Amplifier is a major supplier of MDS/ITFS downconverters and as such we are able to respond to some of the assertions in the Report and Order regarding downconverters.

Assertion : MDS/ITFS industry is converting to new downconverters that will not receive WCS signals.

Response : Given the fact that there appears to be no limitation on the maximum EIRP from WCS transmitters, it ludicrous to assert that new downconverters will not receive the WCS signal.

There is no known technology which will give infinite frequency selectivity to ensure that downconverters will not receive signals from WCS transmitters with no limitations on EIRP.

California Amplifier, Inc.
460 Calle San Pablo
Camarillo, California
93012 USA

Assertion : Digital downconverters will not be subject to overloading from WCS signals.

Response : California Amplifier is already supplying digital downconverters to the industry. These downconverters will be subject to overloading if they are closer than 300 feet to a WCS transmitter with an EIRP of 20W.

Again, if there is no limitation on the maximum EIRP from WCS transmitters, it is ludicrous to assert that digital downconverters will not be subject to overload.

Assertion : Within 1 year, more spectrally efficient downconverters would be installed.

Response : California Amplifier cannot even begin to start designing new downconverters until there is a known upper limit on EIRP from WCS transmitters. Therefore we cannot give any schedule on product availability.

We would hope that the Commission would protect existing MDS/ITFS downconverters, as well as adopting a upper limit on EIRP from WCS transmitters that will allow cost effective MDS/ITFS downconverters to be developed, thereby serving the best interests of the consumer.

Your sincerely

Robert J. Hannah
Vice President, Engineering

cc: I. Coron, K. Kelkar, M. Ferron, B. Sturtz

Phone (805) 987 - 9000
Fax (805) 388 - 2827

LETTER FROM CONIFER CORPORATION

CONIFER II™
WIRELESS TELECOMMUNICATION TECHNOLOGY

March 4, 1997

Mr. Lauriston Hardin
Hardin and Associates, Inc.
1300 Diamond Springs Road, Suite 600
Virginia Beach, VA 23455

Dear Mr. Hardin,

This letter is in follow up to our telephone conversation(s) regarding the Commission's WCS Report and Order. This letter is intended to express the concerns Conifer Corporation has in regards to certain aspects of the WCS Report and Order.

The Conifer Corporation is a pioneer in the design and manufacturing of antenna and downconverter products for the reception and transmission of 2.150 GHz through 2.690 GHz MDS/ITFS/MMDS signals. Conifer Corporation history dates back to the single/dual channel MDS systems, four (4) channel ITFS products and beyond with analog/digital products for current thirty-three (33) channel MMDS systems.

The new Wireless Communications Services at 2305-2320 MHz and 2345-2360 MHz represents a serious potential as a source of overload type interference to existing MMDS receive sites as well as MMDS receive systems yet to be constructed. The degree of WCS interference to MMDS receive sites can not be assessed accurately without first knowing the ***maximum EIRP that WCS transmission sites will be limited to.***

It is the opinion of the Conifer Corporation that WCS EIRP be limited to twenty (20) watts based on the following:

MMDS interference from WCS

Assumptions: MMDS receiver input level for 1 dB compression = - 6 dBm
Gain of MMDS receive antenna ----- 3' parabolic = 24 dBi
Distance of MMDS receiver from WCS Tx site -- = 100 yd.
WCS transmitter frequency (CW Mode) --------- = 2305 MHz

Calculation: Maximum EIRP of WCS transmitter without compressing MMDS installation =

$$EIRP\ max = -6 + (20 \log (100/1760) + 20 \log (2305) + 36.8 - 24$$

$$= -6 + (-24.91 + 67.25 + 36.8) - 24$$

$$= 49.14\ dBm\ or\ 80\ watts$$

Continued on Page II of II

March 4, 1997
Mr. Lauriston Hardin
Page II of II

Conclusion: **WCS EIRP levels greater than 80 watts will begin to compress the MMDS receiver and result in it being in a non-linear operating region. Good engineering practice dictates that the input power be 6 to 10 dB below point of overload. Therefore limiting WCS EIRP to 8 to 20 watts would allow the two (2) services to co-exist with minimal negative interaction.**

WCS systems with a limited EIRP of 20 watts will be able to operate in 100 watt MMDS markets for the following reasons:
* **Cellular approach will allow additional WCS cell sites as required**
* **WCS systems are likely to be 100% digital as opposed to analog for many MMDS systems**
* **As a start up service WCS can install units with RF selectivity as required to avoid interference from other near band services**

<u>New MDS/ITFS Block Downconverters</u> --- To our knowledge efforts to provide "more robustly designed downconverters" as quoted in the Commission's WCS Report and Order have focused on:
* **Low phase noise**
* **Flat frequency response**
* **Recovery time from short duration overload bursts**
* **Low noise figure (First amplifier stage in front of RF filter) for best S/N performance**
* **Improvement of linear performance for processing of QAM signals with minimal degradation**

Note: ***RF filtering traditionally has been dealt with on a market by market basis --- WCS and other services entering the market place will impact downconverter design and costs by the level of RF filtering required.***

<u>Existing In-the-Field Downconverters</u>
* **There are a number of analog MMDS systems in operation which have no plans to switch to a digital type service and therefore are not likely to install higher priced digital equipment.**
* **The design of these units have centered on low cost, low noise figure units with RF selectivity as required for a specific market.**
* **Limiting the WCS EIRP to 20 watts would allow many of the currently installed analog downconverters to remain in service.**

The Conifer Corporation recognizes the increased demand for radio frequency spectrum and stands ready to respond to MMDS downconverter RF selectivity requirements as soon as the Commission sets a limit on EIRP for the WCS transmitters.

Sincerely,

Dale L. Hemmie

Dale L. Hemmie
V.P. Engineering

cc: Marc M. & Paul H.

ANALYSIS OF INTERMODULATION PRODUCTS

CAI WIRELESS SYSTEMS, INC

Table

2PCS-WCS

	2305	2310	2315	2320	2345	2350	2355	2360
1930	1555	1550	1545	1540	1515	1510	1505	1500
1940	1575	1570	1565	1560	1535	1530	1525	1520
1950	1595	1590	1585	1580	1555	1550	1545	1540
1960	1615	1610	1605	1600	1575	1570	1565	1560
1970	1635	1630	1625	1620	1595	1590	1585	1580
1980	1655	1650	1645	1640	1615	1610	1605	1600
1990	1675	1670	1665	1660	1635	1630	1625	1620

2PCS+WCS

	2305	2310	2315	2320	2345	2350	2355	2360
1930	6165	6170	6175	6180	6205	6210	6215	6220
1940	6185	6190	6195	6200	6225	6230	6235	6240
1950	6205	6210	6215	6220	6245	6250	6255	6260
1960	6225	6230	6235	6240	6265	6270	6275	6280
1970	6245	6250	6255	6260	6285	6290	6295	6300
1980	6265	6270	6275	6280	6305	6310	6315	6320
1990	6285	6290	6295	6300	6325	6330	6335	6340

Shading indicates interference with GPS

2WCS-PCS

	2305	2310	2315	2320	2345	2350	2355	2360
1930	2680	2690	2700	2710	2760	2770	2780	2790
1940	2670	2680	2690	2700	2750	2760	2770	2780
1950	2660	2670	2680	2690	2740	2750	2760	2770
1960	2650	2660	2670	2680	2730	2740	2750	2760
1970	2640	2650	2660	2670	2720	2730	2740	2750
1980	2630	2640	2650	2660	2710	2720	2730	2740
1990	2620	2630	2640	2650	2700	2710	2720	2730

2WCS+PCS

	2305	2310	2315	2320	2345	2350	2355	2360
1930	6540	6550	6560	6570	6620	6630	6640	6650
1940	6550	6560	6570	6580	6630	6640	6650	6660
1950	6560	6570	6580	6590	6640	6650	6660	6670
1960	6570	6580	6590	6600	6650	6660	6670	6680
1970	6580	6590	6600	6610	6660	6670	6680	6690
1980	6590	6600	6610	6620	6670	6680	6690	6700
1990	6600	6610	6620	6630	6680	6690	6700	6710

Shading indicates interference with MMDS/ITFS.

MMDS/ITFS Receiver sensitivity = xxx (1 Mhz bandwidth)

Max WCS power: x dBm
Max PCS power: 62 dBm EIRP (1640 Watts) in an unspecified bandwidth.
Typical max TX power for PCS base stations is: 57 dBm/15 MHz (DCS-1900) ==> 46 dBm/MHz
(Assuming 17 dBi gain antennas)

Isolation between PCS antenna and WCS antenna is at least:
(12.45 + 20*log(f*d) - G) dB. (f in MHz, d in meters) = 88 dB for 10 meter separation, G = 10dB)
PCS interferer level at WCS Transmitter ==> 46 dBm - 88 dB = -42 dBm

Up to 3 WCS channels can simultaneously interfere: + 4.7 dB

WCS / PCS 3rd Order Intermods in the MMDS/ITFS Band

		WCS A	WCS B	WCS C	Guard Band	WCS D	WCS A'	WCS B'
		2305-2310 MHz	2310-2315 MHz	2315-2320 MHz	2320-2345 MHz	2345-2350 MHz	2350-2355 MHz	2355-2360 MHz
E3 (MMDS)	2620-2626 MHz	Interference						
F3 (MMDS)	2626-2632 MHz	Interference	Interference					
E4 (MMDS)	2632-2638 MHz	Interference	Interference					
F4 (MMDS)	2638-2644 MHz	Interference	Interference	Interference				
G1 (ITFS)	2644-2650 MHz	Interference	Interference	Interference				
H1 (ITFS)	2650-2656 MHz	Interference	Interference	Interference				
G2 (ITFS)	2656-2662 MHz	Interference	Interference	Interference				
H2 (ITFS)	2662-2668 MHz	Interference	Interference	Interference				
G3 (ITFS)	2668-2674 MHz	Interference	Interference	Interference				
H3 (ITFS)	2674-2680 MHz	Interference	Interference	Interference				
G4 (ITFS)	2680-2686 MHz	Interference	Interference	Interference				

INFORMATION ON 2.4 GHZ PRODUCTS

AIRONET HAS MORE THAN 325,000 WIRELESS LAN DEVICES INSTALLED WORLDWIDE

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From OEM radios for your wireless devices to our patented ARLAN® network architecture, Aironet can be your full line supplier of quality components for a complete, seamless wireless LAN solution.

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WIRELESS LAN INFRASTRUCTURE PRODUCTS

- ▲ ARLAN® Patented Wireless LAN Network Software
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Circle 702

American Airlines uses wireless LANs for cargo handling and passenger reservations

American Airlines is using Aironet 2.4 GHz DSSS wireless LANs and Telxon hand held wireless terminals for real-time cargo tracking at its eight largest U.S. cargo facilities.

[redacted]erican Airlines)
[redacted]cargo handling
[redacted]ess Communications

American Airlines is increasingly relying on wireless communications to optimize both customer service and operational productivity and differentiate its services in a highly competitive marketplace. The reason is simple—with 70,000 mobile workers who often require information stored on computers, some nearby and some far away, there is simply no better way to optimize connectivity.

"With wireless networking, our mobile workers can get the information they need, when they need it, wherever they happen to be," says Lance Crawford, manager for wireless data technologies at the SABRE Group, based in Dallas, Texas. "Since this information is essential to American's ability to deliver the highest levels of service their customers expect, wireless has become a business critical tool."

The SABRE Group, a division of AMR—the holding company of American Airlines—provides decision technologies and information systems to American Airlines. The SABRE Group offers similar services on a consulting or outsourcing basis to a number of other external companies. The company also markets the SABRE reservations system to more than 29,500 travel agencies and corporations worldwide.

As part of American's wireless strategy, the company has begun installing a 2.4 GHz direct sequence spread spectrum (DSSS) wireless LAN from Aironet Wireless Communications, Inc. in airports around the world. The initial application is an online, real-time cargo tracking system currently being rolled out at American's eight largest U.S. cargo facilities.

"With this system," Crawford says, "we can more effectively handle cargo before it is put onto aircraft. In addition, with information being real-time, we always know exactly where every part of every shipment is located, down to the specific cargo containers utilized, the flight number each of those containers needs to be loaded onto, where in the plane the containers are to be placed and whether those containers have already been loaded. The bottom-line result: our operation is streamlined and our customers receive better service."

The cargo tracking application relies on Telxon hand-held terminals used by mobile cargo handlers for data input and display. These terminals—50 at each of the eight sites—incorporate integrated Aironet OEM wireless LAN modules and built-in barcode scanners. They communicate with the network server via Aironet Access Points installed throughout the cargo terminal and connected directly to the existing wired Token Ring LAN backbone. Each Access Point creates a "microcell" of radio coverage that is an extension of the network backbone. Access Points use Aironet's patented Microcellular architecture to seamlessly hand off mobile clients to each other as they roam from cell to cell. This allows the cargo handlers complete mobility throughout the facility, which can measure 300,000 square feet or more, and even to areas outside the building, while maintaining a network connection to the cargo tracking application.

The system is a substantial improvement over an earlier hand-held batch terminal system that required workers to place units in a cradle to upload data to the network server. The Aironet solution allows real-time updates, is less prone to user errors and provides the cargo handler with up-to-date information from the central computer, all of which was impossible with a batch system.

In addition to the cargo tracking application, American is also utilizing its Aironet wireless network to provide wireless connectivity to ticket and gate agents who can now rely on laptop and pen computers to improve customer service inside the terminal. "With a wireless connection," Crawford explains, "agents are no longer tethered to their conventional counter positions. As a result, we can enhance customer service by putting up temporary counters or easily moved podiums and using laptops with Aironet wireless PC-Cards, to provide mobile agents with the same full access to our SABRE reservation system as they would have at fixed counter positions."

American chose ruggedized laptops from Itronix and PC-Card wireless adapters from Aironet for the mobile agent application. These same laptops can be used to link to American's wide area network via CDPD. "Not all applications for laptop connectivity are local," Crawford explains. "For example, if weather delays occur and we have to overnight passengers in hotels, we can now simplify rerouting by having our customer service agents handle all processing tasks on-site, at the hotel, thereby minimizing any inconvenience to our passengers."

Once the wireless LAN Access Points are installed in the passenger terminal, new applications can be added easily, and other American operations areas can benefit. "We are aggressively moving to an environment in which wherever information in the field is required, it will be provided with wireless connectivity," Crawford says. "With the Aironet wireless network, pen computer devices and a graphical user interface we developed at SABRE, we will be able to dramatically improve internal efficiency and productivity throughout our operations."

For more information, contact Lance Crawford, manager of wireless data technologies, The SABRE Group, at 817-963-9060 or Todd Smith, director of product marketing, Aironet Wireless Communications, at 1-800-3-WIRELESS.

CIRCLE 702

Hospital uses wireless LAN technology to coordinate therapists efforts

Because of Proxim's RangeLAN2 wireless LAN technology, Wadie Williams, manager of patient support services in St. Luke's Hospital Respiratory Care department, can now coordinate the efforts of respiratory therapists with their work load.

Respiratory therapists can be found working in almost any area of a hospital, and unlike most care providers, they also must travel throughout the hospital to see patients. To make this even more challenging, the patients can be moved from one care area to another at the same time the respiratory therapists are scheduled to see them. Changes in patient schedules make it challenging to provide care and manage demand for service. These challenges can only be overcome with access to real-time patient scheduling and clinical information.

St. Luke's Episcopal Hospital in Houston, Texas, working in cooperation with the Texas Heart Institute, performs more than 4,000 cardiac surgeries annually. It has 150 intensive care unit beds, a forty-bed cardiovascular recovery room and four buildings, one with twenty-seven floors for a total of 949 beds. The size of St. Luke's accentuates the need for respiratory therapists to have real-time communication with their departmental respiratory care information management system (RCIMS).

To address this need, the St. Luke's management team decided to replace their existing RCIMS, using optical wand technology, with the Managers Assistant program from Tempe, Arizona-based MediServe Information Systems and Proxim's RangeLAN2/PCMCIA wireless LAN technology. The Manager's Assistant client program runs on Compaq Contura Aero DX 486 33 MHz sub-notebook computers. St. Luke's has eighteen sub-notebooks with Proxim RangeLAN2/PCMCIA 2.4 GHz frequency hopping spread spectrum wireless LAN adapters. The wireless notebooks communicate with ten strategically located Proxim RangeLAN2/Access Points that bridge them to the standard Ethernet network backbone. The network is connected to a Compaq Prolient 100 MHz Pentium server running Novell NetWare Version 3.12, which ultimately interfaces with the hospital's IBM mainframe. The wireless LAN covers all three buildings and twenty-six hospital floors. All sixty of St. Luke's respiratory therapists, over three shifts, use the Manager's Assistant program and Proxim wireless LAN.

With real-time information collected over the wireless LAN, management can match staff with the constantly changing demand for respiratory care services. "Resource management is significantly improved with real-time communications. At anytime we can analyze how much work is out in the hospital and what percentage of that work is completed. We are now also able to instantly evaluate fluctuations in demand. This could not be done if the information was being periodically downloaded to the RCIMS by the respiratory therapists," says John S. Sabo, MS RRT, RCP.

Real-time communications allows St. Luke's to coordinate respiratory therapy procedures and patient load fluctuations throughout the day. "A patient that comes into the emergency room is treated by a respiratory therapist. That patient is moved to a patient care floor, then rushed to the 'cath' lab (depending on chest pains), then ultimately moved to an intensive care unit. A respiratory therapist may need to see them at any point in the process," says Sabo.

"Proxim's wireless technology allows us to address the challenge created by fluid patient scheduling and the mobility of our respiratory therapists. Now we immediately know where the patient is, what care they have received and their current treatments. Only real-time information allows you to keep a pulse on work loads as they go up or down. This allows us to meet staffing demand. It also allows us to perform workload forecasting for the next shift," says Sabo.

"We anticipate that this technology will improve staff efficiency and timeliness and the accuracy of information. The RangeLAN2 wireless LAN has taken us from batch mode documentation to real-time information. Ultimately, we expect this to translate into higher quality patient care and improved resource management," says Wadie Williams, RRT, RCP, manager of patient support services in St. Luke's Respiratory Care department.

St. Luke's respiratory therapists now have access to real-time patient schedules and respiratory care records. The hospital's management anticipates that improved communications will help their respiratory therapists be more productive by eliminating the need for travel back and forth to the department for new or revised orders. The therapists also save time because patient therapy modifications are communicated as soon as they occur—dramatically reducing the need to track down patients who have been moved. The elimination of batch transfer of patient care and billing information saves time and, more importantly, potential data loss.

"The bottom line is that Proxim's technology will allow us to manage our resources more efficiently because we can meet the real-time fluctuations in demand for services in both volume and location. In the future, our institutional strategy is to address real-time billing and charging for patients upon discharge. Proxim's technology will allow us to support this strategy," says Williams.

For more information, contact Dan Toporek, public relations manager, Proxim, Inc., at 415-960-1630.

CIRCLE 709

2 Two major U.S. stock exchanges go wireless

When technologists first conceived wireless networks, the obvious applications involved mobile workers—men and women whose duties took them away from the confines of the office and the information and data necessary for making important decisions. These first-line mobile network users included salesmen, route delivery personnel, warehouse workers and many others.

Once wireless networks were proven mature and robust enough to handle increasingly complex and information-intensive applications, the definition of mobility rapidly expanded. You no longer have to jump into a vehicle to be considered mobile. The ability to receive and transmit information without being tethered to a desk, a computer or a phone has enormous appeal to everyone.

Ultimate mobile worker

So who today is the ultimate mobile worker? Take one look at the arm-flapping, paper-waving and dashing about that typifies trading floor activity at a major U.S. stock exchange, and you have the answer—the trader.

Never in one place for very long, yet ever wary of being out of touch for as little as a nanosecond, the stock trader must be able to transmit and receive information instantly and securely in order to remain effective. Millions of dollars can be made or lost in the blink of an eye.

The volume of trading handled by a single trader on any given day is staggering. Multiply that by the number of traders working the floors of both the American Stock Exchange (AMEX) and the New York Stock Exchange (NYSE) and it is immediately apparent why both organizations are implementing wireless LANs to facilitate and manage many aspects of the information process.

AMEX, the first stock exchange to standardize on wireless networking technology, began its wireless efforts with the most information-intensive of all its activities—option trading. Instead of using the traditional hand signals and slips of paper, option brokers can now communicate buy-and-sell orders electronically via Symbol Technologies' Spectrum24 high capacity local area network (LAN). With Spectrum24, traders are free to move about the trading floor at will. They can send and receive orders via radio frequency signals, using small, industry-standard hand-held computers to access information, to make buy-and-sell decisions and to execute trades.

Interoperability allows terminal choice

Individual member brokerage firms select the hand-held computer which best suits their needs and can best accommodate their own specially-written software. Some traders, for example, prefer Pentium color laptops with frill graphic analysis capabilities. Others may opt for smaller, hand-held devices. The computer is then brought on-line by inserting the Spectrum24 one-piece PC radio card, complete with antenna, in the device's PCMCIA Type II expansion slot.

According to Joseph Carrier, managing director of information technology for the American Stock Exchange, about half of their 80-plus hand-held computer users are now operating on the Spectrum24 2.4 GHz frequency standard. The rest are still using their own 902-928 MHz systems. By the third quarter of 1996, Carrier expects Spectrum24 to be fully implemented on the trading floor to accommodate all option traders.

A complete Spectrum24 2.4 GHz wireless infrastructure is now being designed to handle as many as 1,200 mobile devices at the AMEX. Carrier expects the design to be completed and the gateway operational by the second quarter of 1997.

In addition to the broker members who will be connected on-line with their own devices, some 75 AMEX trading floor staff will also go wireless, reporting on trades and updating quotes as they happen. Instead of the tethered devices they currently use, these staff will be operating Symbol PPT 4100 hand-held pen terminals equipped with the Spectrum24 radio card. Cone Software, Inc. of Boothwyn, Pennsylvania, is developing and integrating a fully redundant gateway software system to manage and govern information transmitted via the Spectrum24 network.

Calling it a "new era for the AMEX," William Strauss, senior executive vice president and CFO, American Stock Exchange, is excited by the potential of wireless technology to enhance trading efficiency.

The wireless link for traders on the floor is one of the most significant changes in the operation of the AMEX since we adopted electronic order processing in the late 1960's.

"Traders have instant position management and real-time access to their back office," Strauss said of the Spectrum24 implementation. "The wireless link for traders on the floor is one of the most significant changes in the operation of the AMEX since we adopted electronic order processing in the late 1960s."

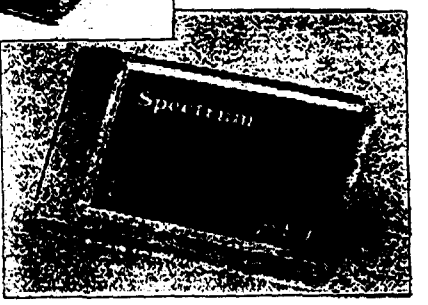
Standards supports means easy integration

Strauss added that the industry-standard interoperability of Symbol's Spectrum24 appealed to an operator that strives to meet the varying needs of its many members. Because Spectrum 24 supports open hardware and software standards, it is readily integrated with existing systems.

Spectrum24 is also the first high-performance wireless LAN designed to support IEEE 802.11, the forthcoming interoperability protocol from the wireless industry's standards development body. Based on a bridge architecture, Spectrum24 provides a transparent connection to an Ethernet LAN through multiple access points. In addition, the seamless roaming among network

Traders on the fast-paced floor of the American Stock Exchange are using Symbol pen-based wireless terminals to transact in real time. The terminals communicate with the Symbol Spectrum24 network, a 2.4 GHz, high-performance wireless LAN designed to support forthcoming industry standards.

The Symbol Access Point is mounted inconspicuously and links to an Ethernet LAN



Backbone of the Symbol Spectrum24 network, the Spectrum 24 wireless LAN PC card is designed to fit in standard PCMCIA slots.

cells makes it easy to serve hard-to-wire locations.

"The communication network is more critical than life itself to our brokers," says Carrier about the fully redundant wireless network. "Millions of dollars can be lost in an eighth of a second if the network goes down or a trader is unable to go online. We chose Spectrum24 for various reasons, such as its vertical integration, its adherence to the IEEE standards and its RF support. But capacity and fault tolerance were also very critical considerations."

NYSE invests in wireless technology

With the implementation of a wireless-data system utilizing Symbol's Spectrum24, the 203-year old New York Stock Exchange (NYSE) is nearing completion of its $125 million Integrated Technology Program (ITP)—the largest capital investment in technology ever undertaken in its history.

The system, being designed by GTE Corp., systems integrator for the project, will ultimately provide more than 1,200 brokers and NYSE staff members with customized hand-held computers equipped with Spectrum24 radio cards for use directly on the trading floor. Information will flow between a broker anywhere on the floor and the brokers' booths.

Currently brokerage assistants located in booths around the perimeter of the Exchange floor use pagers or phones to notify floor brokers of buy or sell orders. The broker then contacts the booth with a cellular or standard telephone for specific information. The broker writes the information on a slip of paper and gives the paper to the specialist handling that stock to complete the transaction. Finally, the broker contacts the booth once again to confirm the transaction.

Interference—resistant frequency hopping

Under the new system, information from the booth can be transmitted directly to the floor broker's Epson EHT-40 hand-held personal digital assistant (PDA) equipped with Spectrum24 one-piece radio card, which can then be used to transmit information back to the broker's booth. The Spectrum24 wireless LAN uses frequency hopping which makes more efficient use of the limited spectrum while rendering the system more resistant to interference.

Frequency hopping is a modulation technique that creates a high-capacity network by using multiple access points within the environment, be it large or small. Each access point, which connects to the wired LAN backbone, executes a unique hopping pattern across 79 non-overlapping frequencies. This minimizes the probability that one cell is operating on the same frequency at the same time as another cell.

The American Stock Exchange and the New York Stock Exchange represent the most information-intensive applications imaginable for any type of network to handle. On the AMEX, primarily an options market, some 25 million trades are made daily. The NYSE, which deals mostly in equities, reports an average of one-half billion trades a day.

These numbers fluctuate with the global market and both exchanges must prepare to handle peak volumes, a consideration that is a high priority in the design and implementation of their wireless networks. The NYSE estimates that going wireless will enable it to expand its capacity to a mind-boggling two billion shares per day.

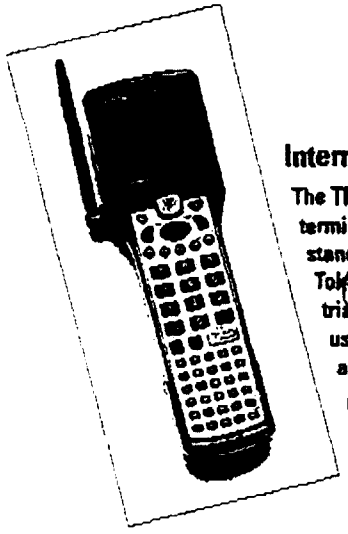
Tradition lovers can rest assured, however; that the image of the frenzied trader, dashing from booth to booth, frantically waving his arms and shouting his buy and sell orders will not be replaced by technology-induced silence. Both exchanges plan to hang on to their people-to-people traditions using wireless technology instead to augment capacity and further insure secure, accurate information flow. Wireless is seen as the next logical step in bringing the exchanges into their next century of operation.

For more information, call Arda Nizaren, director of media relations, American Stock Exchange at 212-306-1634 or Michael Manzer, senior manager, direct response marketing, Symbol Technologies, Inc. at 800-SCAN-234

CIRCLE 711

FEATURED PRODUCTS

PDAs, Hand-Held Computers & Accessories



Intermec's new TRAKKER includes common terminal emulation

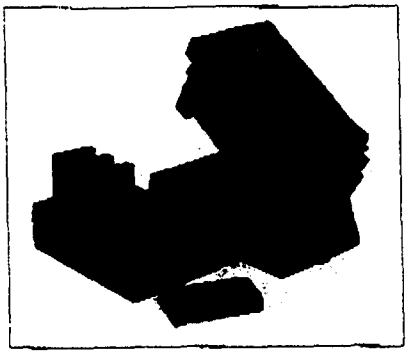
The TRAKKER antares 2425 hand-held RF terminal from Intermec Corporation (Everett, WA) features true SNA terminal emulation for IBM 3270 and 5280 plus TCP/IP support for ANSI and VT environments. Using industry standards and open connectivity, it can be integrated with most host environments, including Ethernet and Token Ring. Its 2.4 GHz radio provides high bandwidth, greater coverage and roaming throughout an industrial environment. Design features include a contoured shape, a scan button positioned for ambidextrous use and a large 16 x 20 character display. The unit's list price is $2590 with an integrated laser scanner and $2,090 without the scanner. For more information, call Intermec at 206-355-9551.

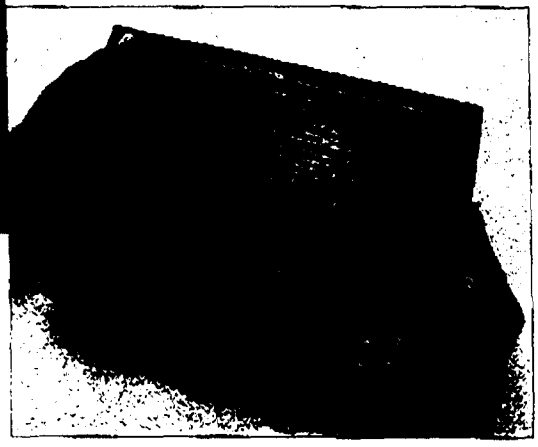
CIRCLE 733

IBM all-in-one hand-held lets retailers handle sales, inventory and networking

Used as a pen-based portable or docked device, IBM's (White Planes, NY) new 4612 Sure Point mobile computer enables users to switch between POS, inventory and network applications on the fly. Sure Point features an integrated scanner, a 486 DX2 66-MHz processor and a 32-bit ISA bus architecture. Its rugged, modular design and PCMCIA slots allow for many custom options such as wireless modems, barcode scanners and magnetic stripe readers. An integrated microphone and speaker allows for voice applications. List price for the unit is $3,445. For more information, call IBM at 919-301-5505.

CIRCLE 734





Omnidata adds wireless capabilities to its line of rugged hand-helds

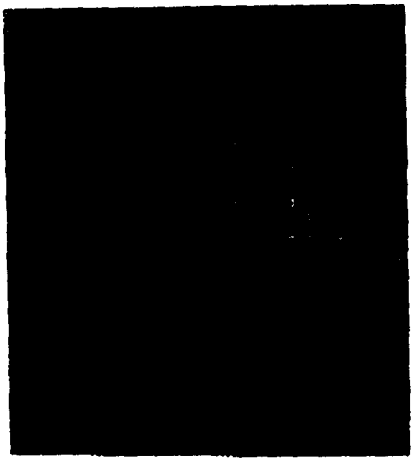
The RDT 3200 from Omnidata International, Inc. (Logan, UT) is a low-cost, portable, 386-based PC with wireless options for GPS, 2.4 GHz, RAM Mobile Data and ARDIS networks, a full screen display, QWERTY keyboard, serial and parallel ports, and two PCMCIA card slots. Built for hash environments, the RDT 3200 can withstand repeated drops from five feet, temperatures ranging from -4 to +122°F and is fully water sealed. With its integrated wireless options, the unit is being targeted to the public safety, field service, medical courier and LTL transport services markets. For more information, call Omnidata at 801-753-7760.

CIRCLE 735

Portable light allows palmtop users to work in dim surroundings

The Ultimate Palmtop Computer Light, model PCL 300, from ASF Associates Ltd. ends non-backlit screen visibility problems for hand-held computer users. It evenly illuminates the display, keyboard and work area. The PCL adjusts to fit any palmtop computer, PDA or electronic organizer. The PCL comes with a DC car adapter, a high-low dimmer switch, a soft travel case, spare bulbs (including red bulbs for night vision) and a clip for attaching to a hand-held device. List price is $29.95. For more information, call ASF Associates at 800-771-3600.

CIRCLE 736

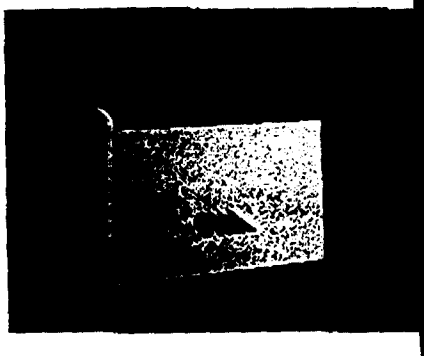


Wi-LAN's new Ethernet bridge extends hardwire LANs

The Hopper Plus 1.5 Mbps wireless Ethernet bridge from Wi-LAN Inc. (Calgary, Alberta, Canada) can provide bridging for up to 10 remote Ethernet networks. The unit is designed for companies looking for an alternative to expensive T1 connections and does not require packet translation or the additional data links and terminal equipment that a T1 does. It operates in the 902-928 MHz ISM bands and uses direct sequence spread spectrum technology with three levels of network security: unique spreading codes, irregular transmission OF data packets, and a unique customer access code. Prices start at $2,500. For more information, call Wi-LAN Inc. at 403-273-9133.

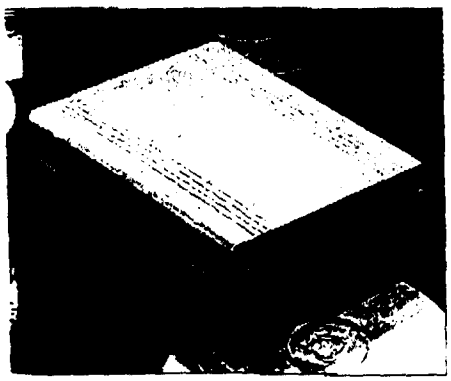
CIRCLE 742

Clarion unveils 10 Mbps Wireless LAN Transceiver



Clarion Corporation of America's newly formed Wireless LAN Division (Allendale, NJ) has released the first member of its MerLAN family of wireless data communications products, the M10 10 Mbps wireless Ethernet-based transceiver. The spread-spectrum unit uses a single 2.4 GHz ISM band and is fully compliant with IEEE 802.3 and Ethernet II standards. Clarion comments that the M10 will support 802.11 once it is accepted as a standard. The unit has plug-and-play capability, allowing users to simply connect the M10 to the AUI port of an Ethernet card without having to install additional software or re-configure the system. For more information, call Clarion Wireless LAN Division at 201-818-1166.

CIRCLE 741

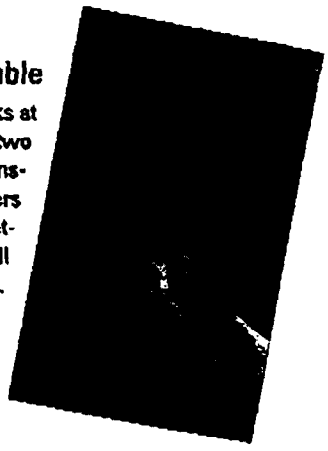


Air Quatro networks up to 16 POS terminals over ARDIS and Mobitex

In its first series of wireless offerings, International Verifact Inc. (IVI) [Toronto, Ontario, Canada] introduces the Air Quatro wireless point-of-sale (POS) device. Air Quatro is a wireless LAN controller that manages up to 16 POS terminals for wireless communications via the ARDIS and Mobitex data communications networks. Compact in size, the unit operates in a completely unattended environment and requires no operator assistance. Air Quatro is also able to automatically switch data packets from one communications protocol to another based on the message's destination code. The unit connects to POS terminals' RS-485 port for 9600 Kbps communications. For more information, call IVI at 416-245-6700.

CIRCLE 740

AirEZY Bridge gives T1 connectivity without cable



Using spread-spectrum technology, OTC Telecom's (San Jose, CA) AirEZY Bridge delivers wireless data links at speeds of up to 1 Mbps and maintains a reliable connection for up to 500 feet in office environments and two miles in building-to-building links. The unit operates in the 902-928 MHz bands and does not require FCC licensing. It will interoperate with any existing Ethernet network operating system and requires no additional drivers or installation software. The AirEZY Bridge connects directly to the Ethernet bus or network interface of a network server or hub through either an RJ-45 or BNC connector. Its list price is $3,500. For more information, call OTC Telecom at 800-770-6698.

CIRCLE 743

I, Stephen R. Mead, hereby certify that on this 10TH day of March, 1997, I caused copies of the foregoing Petition for Expedited Reconsideration to be served, by first class postage prepaid U.S. Mail, on the following:

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Federal Communications Commission
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Washington, D.C. 20554

*Commissioner Rachelle B. Chong
Federal Communications Commission
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*Commissioner Susan Ness
Federal Communications Commission
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*Blair Levin
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